DOCUMENT RESUME

ED 231 124 EC 151 999

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TITLE Alternate Interface Devices for the Physically Handicapped.
PUB DATE Mar 83
NOTE 9p.; Paper presented at the National Conference on the Use of Microcomputers in Special Education (Hartford, CT March 10-12, 1983).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computers; *Electromechanical Aids; *Physical Disabilities; Technological Advancement

ABSTRACT

Six interface devices which students with physical impairments may use when operating the Apple II computer are described along with advantages and disadvantages, and source (when appropriate). These are: the Time Delay Keyboard, Keyguard, Magic Keyboard, Presfax-100 Touch Key-Pad, Switches (single and multiple), and Optical Strip Printer. (MC)

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ALTERNATE INTERFACE DEVICES FOR THE PHYSICALLY HANDICAPPED

In order to meet the needs of students having a broad range of physical limitations, a variety of interface devices and techniques have been acquired and/or developed by the staff at the Shrine School in Memphis, Tennessee. Listed below are several of these, along with a brief description, and our perceived advantages and disadvantages of each.

(1) Time Delay Keyboard: This is a software routine which provides the user with the option of typing a single character, and then having the computer wait a pre-selected amount of time before that character is actually accepted as input. One feature of the Apple II computer is a keyboard strobe which goes high when any key is pressed. Once a key is pressed, the appropriate character is displayed, and control is shifted to a timing loop. This loop also polls the keyboard strobe so that, if another key is pressed before time is up, the displayed character can be replaced by the new character. The timing loop is then re-initialized and subsequently re-entered. If the timing loop is not interrupted, a tone sounds, and the outer loop prepares to receive the next character.

Advantages: This technique reduces frustration associated with students who know the correct answer, but who frequently

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press the wrong key due to some physical problem.

Disadavantages: If not needed, the extended time required for input using this technique can be frustrating.

(2) Keyguard: (Prentke-Romich Co, 8769 Twp Rd 513, Shreve, Ohio, 44676. Price: $110; Also available soon from COPH-2, 2030 West Irving Park, Chicago, Illinois, 60618. Price: approximately $25) This device allows the user to rest his hand on the keyboard and type with one finger. To activate keys, the user must poke his finger (or some type of pointer) through the appropriate hole and depress a key. Provision is also made for using the shift and control keys.

Advantages: (advantages and disadvantages listed are for the P-R version only) This device appears to work as advertised.

Disadvantages: The cost seems a somewhat high. In addition, when mounted on the key-board, the device may tend to block the view of the user so that symbols on the keys can not be seen. Some difficulty is encountered while installing, or removing the device, and, while this is not a major barrier, it could pose a problem for the exact population for whom it was designed.

(3) The Magic Keyboard: (Southern California Research Group, Box 2231, Goleta, Ca., 93118. Cost: $90.) This device is a small circuit board (with four chips) which plugs into

the socket on the Apple Motherboard which normally takes the cable from the keyboard. The keyboard cable, in turn, plugs into the Magic Keyboard circuit board. With this device, the user has the option of using the Apple keyboard with keys in their normal pattern of arrangement, or of using one of several alternate arrangements. Included among the alternate forms available are two formats designed for prople having the use of only one hand. These two formats (one for right hand, and one for left hand) are specifically designed to allow one easy access to the most commonly used keys. Several numeric keypad formats are provided, as are stickers for the user to place on the keys indicating their alternate functions. Provisions are also made for aquiring custom designed formats for specific needs.

Advantages: This device is very appropriate for those students with limited arm and hand movement. Any modified keyboard can be changed back to the standard Apple with a single switch.

Disadvantages: This device requires slight modification to the existing Apple mother-board which may discourage some users.

(4) Presfax-100 Touch Key-Pad: (Computer Data Services, Box 696, Rt. 122, Amherst, NH., 03031. Cost: $95) This device consists of a 10 x 10 matrix of 1 1/4 inch square

switches mounted on a thin board. Interface to the computer is achieved by a ribbon cable which connects to the Apple's game I/O socket. In addition, a disk of software useful in demonstrating and calibrating the board is included. The board's driver is a machine language routine which, when a key is pressed, produces a tone, and returns the number of the key, as well as its X and Y coordinates. In operation, the board is normally covered with a paper overlay which assigns values to the keys. Software must be specific to the overlays. For example, if key number 1 is pressed, this information is passed to the main program by the machine language driver routine. It is up to the main program to decide whether the key pressed represented a number, letter, or picture on the overlay, and make the appropriate response.

Advantages: The large keys encourage easy access and are activated by light pressure. This device is extremely adaptable in terms of presentation format, and subject level. It is relatively inexpensive and probably more adaptable than expanded keyboards.

Disadvantages: The Presfax-100 must be "recalibrated" periodically, and Software has to be designed specifically for this device, and even for specific overlays.

(5) Switches: The Apple Computer supports three switches through it's game I/O socket. There are a variety of ways

to make use of the switches. The "Ping-Pong" switches demonstrated are momentary (normally open) switches constructed by the University of Tennessee Rehabilitation Engineering Center (Memphis, Tennessee). The Brow Wrinkle Switch (from Trace Research and Development Center for the Severely Communicatively Handicapped, University of Wisconsin - Madison, 314 Waisman Center, 1500 Highland Ave, Madison, Wisconsin, 53706. Price about $40) is essentially a reed switch which closes when moved into the field of small magnet by a wrinkled brow. Switches are usually used in either a single, or multiple switch format:

Single switch: Typically, when a single switch is used, displayed are a line of words, letters, or numbers by which passes a pointer. When the pointer indicates the appropriate letter or word, the switch is depressed by the user. The software "knows" which word, or letter was being indicated, and acts accordingly. In a more complex situation, a matrix of words, letters, or numbers is presented in the initial display. The pointer is programmed to first move down, pointing at each successive row until a switch is pressed. At this point, the pointer moves across the selected row until the desired column is reached, at which time the switch is again depressed. This method of input provides for a larger choice of items, with but a slight increase in input time.

Multiple switches: Usually, with this input mode, some form of multiple choice problem is presented, and the student hits the left switch, for example, to indicate the left-most choice, or the right switch to indicate the right-most choice.

Advantages: Switches are easy to build and to use, and are usually quite adaptable to a student's physical limitations. They are relatively inexpensive, and easy to support with soft-ware.

Disadvantages: The Apple computer is designed to support three switches, and this may not prove to be enough in some applications.

(6) Optical Strip Printer: (Prentke - Romich) The optical strip printer (OSP) was designed as a communication device for individuals with little physical control other than in the head and neck regions. A sensor attaches to the user's head, and is pointed to the OSP in order to "type" a message on a paper strip. The OSP also features an interface port through which it can be attached to the Apple computer through a serial interface card. When so configured, the Apple interprets characters typed on the OSP as originating on its own keyboard.

Advantages: This device provides an efficient interface method for users who are extremely physically involved, but who are mentally capable of using the input potential which a

full keyboard offers.

Disadvantages: Software must support the device, and since most commercially available software packages are read-protected, alterations could pose problems. In addition, some commands (GET in Applesoft, for example) are not permitted, as is the simultaneous use of two keys (eg: control - C).

It is the hope of the staff at the Shrine School that material discussed in the above presentation, while by no means exhaustive of the topic, will at least serve as a small spring-board for further exploration and creativity in the area of relatively inexpensive alternate interface devices for the physcially hancapped. With this in mind, I am anxious to communicate with software developers with similar goals. Please contact me at the following address:

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A Paper Presented at the Council for Exceptional
Children's National Conference on the Use
of Microcomputers in Special Education

Hartford, Connecticut
March 10-12, 1983